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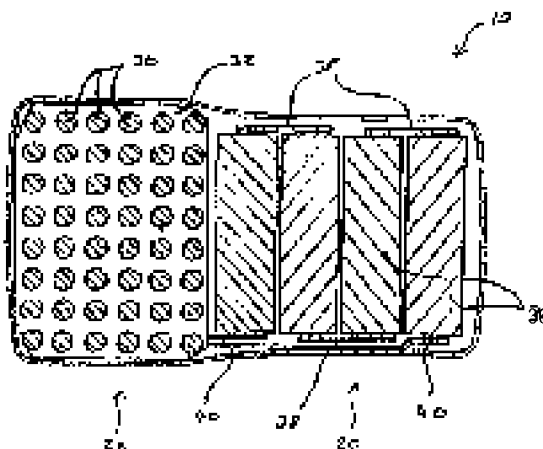
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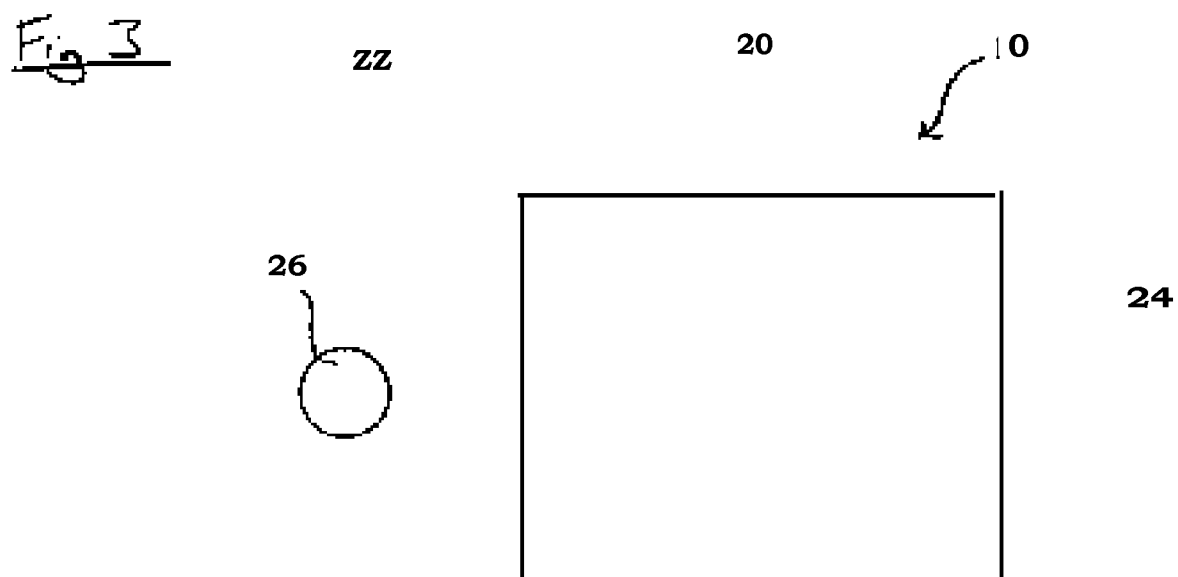
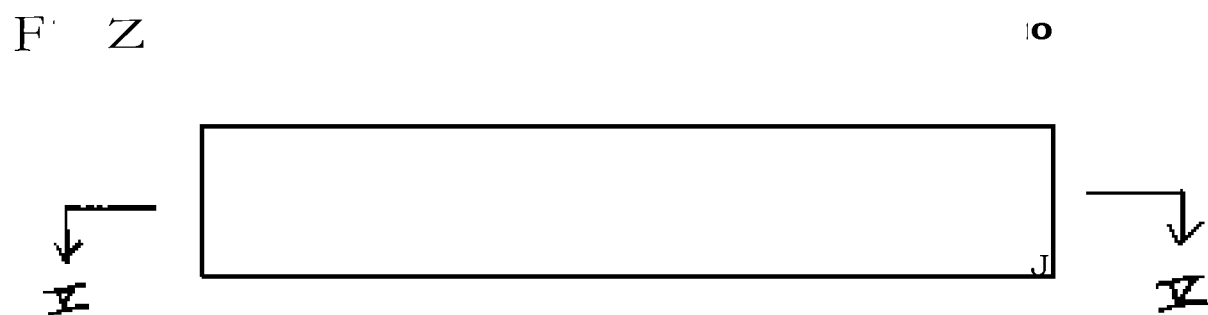
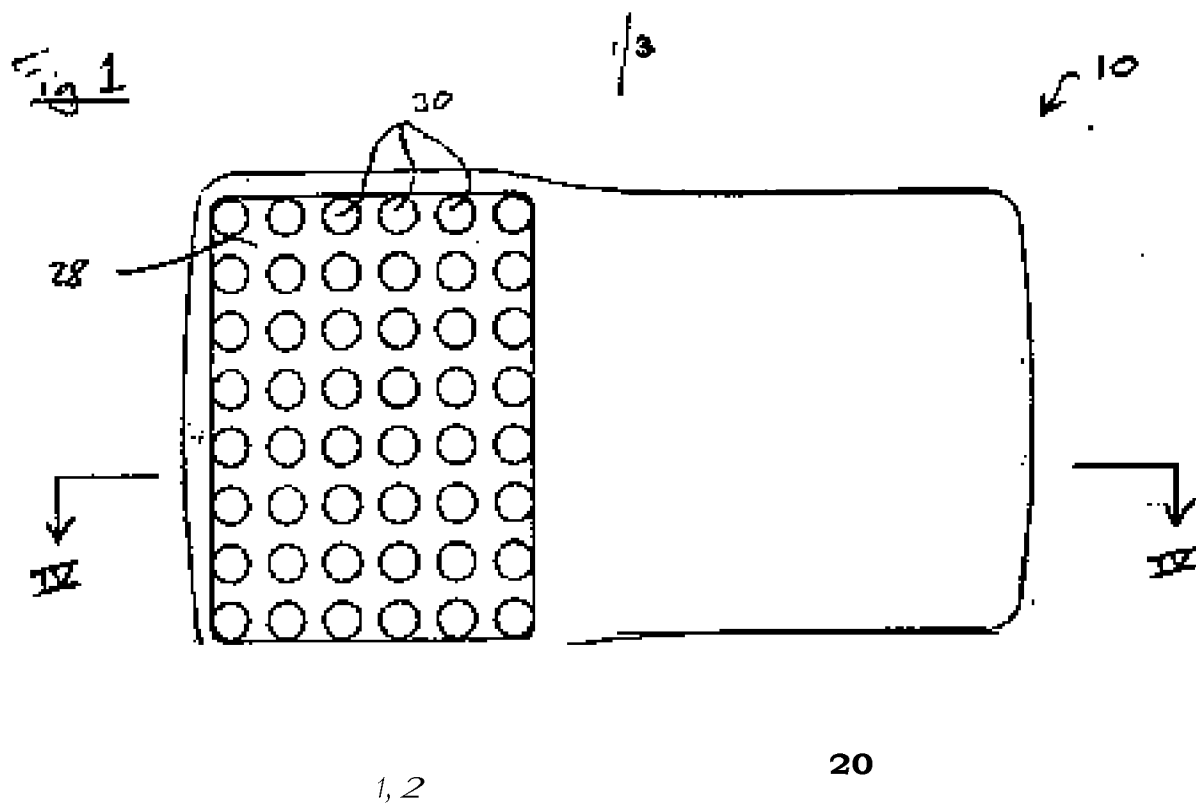
(58) Field of Search:  
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European! Patent! Office

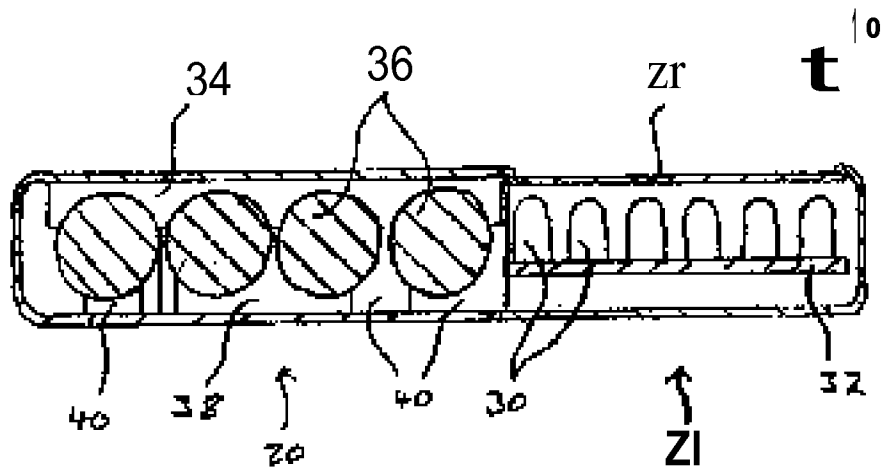
(54) Abstract! Title: HAND-HELD! LED! APPARATUS! FOR! TREATING! ACNE

(57) A! hand! held! device! 10! for! the! treatment! of! acne  
includes! a! casing! with! an! operative! portion! 22,! an  
array! of! LED's! 30! emitting! blue! light! with! a! peak  
wavelength! of! approximately! 430nm,! which! may! be  
parallel! arranged,! Gallium! Nitride! LED's! mounted! on  
a! PCB! 32,! a! handle! 20! and! batteries! 36.



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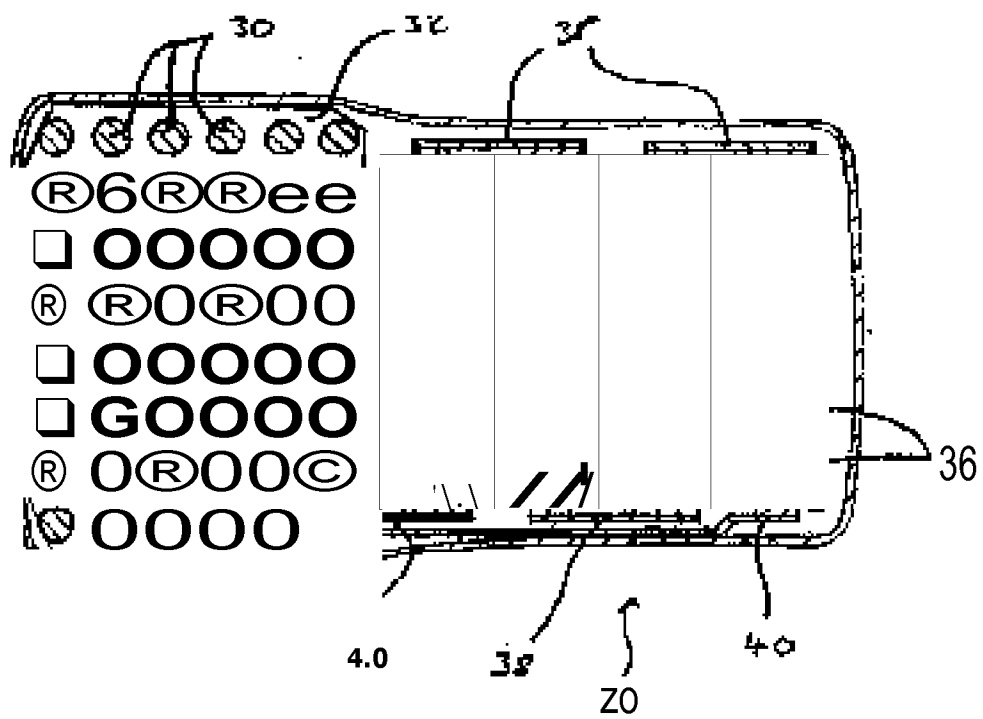
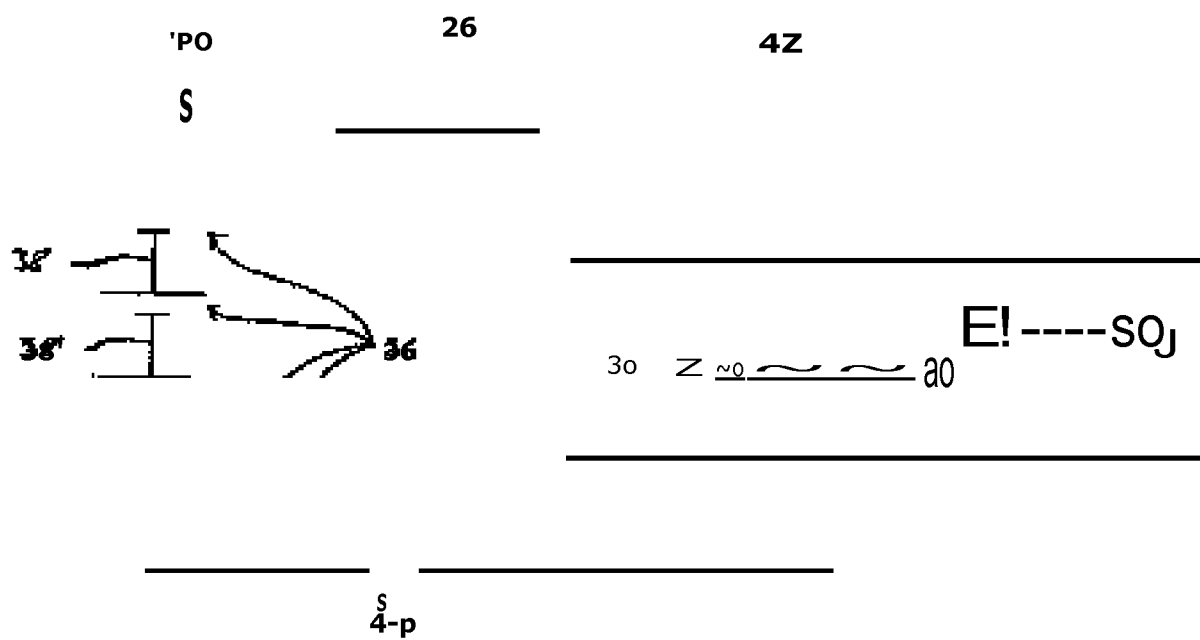


Fig 6



Device and Method for Treating Acne

This invention relates to a device and method for treating acne, and in particular a device which uses electromagnetic radiation to treat acne.

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Acne vulgaris (acne) is a chronic inflammatory condition of the pilosebaceous units of the skin, which is particularly prevalent in adolescents. The condition generally causes the formation, on the skin, of comedones, red papules, pustules and sometimes cysts. This is unsightly and furthermore, if untreated, acne can lead to

10 scarring of the skin. The major causes of acne are thought to be: an increase in sebum production, an increased presence of *propionibacterium acne* (*P. acne*), blockage of the pilosebaceous duct and the production of inflammation.

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Conventional treatments for acne include the administering of medicaments such as antibiotics and vitamin A analogue, and the use of topical formulations.

Although these treatments are reasonably effective, they can cause unwanted side effects such as skin irritation. In addition, people are often reluctant to use medicaments such as antibiotics over a prolonged period.

20

Other treatments currently available, include exposing the affected skin to electromagnetic radiation of particular wavelengths. Conventionally, this treatment is carried out in specialised clinics using lasers or fluorescent tubes. A

disadvantage of such treatments is that the patient is required to visit the clinic to receive the treatment. The treatment is often relatively intense so that the patient

25 does not have to return too frequently. Such intense treatment may therefore cause damage to the skin, this being a further disadvantage of such treatment.

A major disadvantage of all the above treatments is the cost of maintaining a course of treatment over the many years that acne can persist.

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There has now been devised a device and method for treating acne, which overcome or substantially mitigate the above-mentioned and/or other disadvantages of the prior art.

- 5 According to the invention, there is provided a handheld device for treating acne comprising an array of light emitting diodes (LEDs) which, in use, emit electromagnetic radiation from the device.

Typically, the electromagnetic radiation has a peak wavelength in the range 330 to  
10 500nm, preferably between 360 and 470nm, more preferably between 390 and 440nm and most preferably between 410 and 430nm.

The array of LEDs may consist of LEDs of a single type, or of two or more different types. Preferably, the LEDs are all of the same type.

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One type of LED that has been found to be particularly useful in the invention is the gallium nitride (GaN) LED. The device according to the invention thus preferably comprises an array of gallium nitride (GaN) LEDs. A presently preferred GaN LED is that known as BLUELINE Hyper 5mm (T1  $\frac{3}{4}$ ) LED, Non  
20 Diffused LB 5416 (sold by Infineon Technologies AG, St.-Martin-Str. 53, 81669 Munich, Germany), which has a peak wavelength of 428nm.

The array of LEDs preferably comprises between 10 and 100 LEDs, most preferably between 35 and 65 LEDs. In use, the LEDs are connected to a power  
25 source, preferably in parallel with each other. The LEDs are preferably arranged in a square or hexagonal array, and are preferably orientated in a similar direction to each other. The LEDs may also have a relatively narrow viewing angle, preferably less than 45° and more preferably less than 20°, so that, in use, as much electromagnetic radiation as possible is directed towards the skin.

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The device is preferably of a size and shape so as to be easily portable and may include a stand. The power source may be external of the device, such as a mains supply, or enclosed within the device, such as a battery or a series of batteries. Preferably, batteries are received within the device to act as the power source. The batteries preferably provide each LED with a voltage of between 3 and 9V, for example 6V.

The device preferably comprises a handle portion and an operative portion. The handle portion preferably encloses the batteries. The operative portion preferably has a window through which the electromagnetic radiation is emitted. The window preferably comprises a sheet of transparent material. The window preferably has dimensions in the range 20 to 100mm and is preferably rectangular.

In use, the device is held by the user, or supported by a stand or the like, in such a way as to expose the area of skin that is affected by acne to the electromagnetic radiation emitted by the device. The device is typically held between 1 and 15cm away from the skin, more preferably between 2 and 10cm. Each area of skin affected by acne is preferably exposed to the electromagnetic radiation for between 2 and 30 minutes, more preferably between 5 and 15 minutes. The device is typically used daily.

Thus, according to another aspect of the invention, there is provided a method of improving the appearance of a person's skin, which method comprises positioning a device as described above in proximity to an area of the skin and actuating the device so as to irradiate the skin with electromagnetic radiation.

The invention will now be described in greater detail, by way of example only, with reference to the accompanying drawings, in which

Figure 1 is a plan view of a device according to the present invention;

Figure 2 is a side view of the device;

Figure 3 is an underside view of the device;

5 Figure 4 is a sectional view of the device along the line IV-IV in Figure 1;

Figure 5 is a sectional view of the device along the line V-V in Figure 2; and

Figure 6 is a schematic circuit diagram of the device.

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Referring firstly to Figures 1, 2 and 3, a device according to the present invention is generally designated 10. The device 10 comprises a casing having a handle portion 20 and an operative portion 22. The device 10 is generally rectangular in shape but with the width of the handle portion 20 being less than that of the  
 15 operative portion 30. The device 10 is approximately 115mm in length, 65mm in width and 20mm in depth. The casing may be of any suitable material but a plastics material is preferable. Typically, the casing comprises a pair of cooperating components, each injection-moulded in plastics material.

20 The lower surface of the casing has a removable panel 24 extending across the entire length and the majority of the width of the handle portion 20. The removable panel 24 also extends a certain distance along the end face of the handle portion 20. The lower surface of the casing further includes an on/off switch 26, which is situated within a circular aperture in the centre of the operative portion 22.

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The upper surface of the casing has a rectangular opening extending across the majority of the width and length of the operative portion 22. Affixed to the interior of the casing, immediately behind this opening, is a transparent sheet 28 of slightly greater dimensions than the opening. The opening and transparent sheet 28  
 30 therefore form a window into the device 10. Behind the transparent sheet 28, mounted within the casing, is a PCB 32 (shown in Figure 4) having a regular array



of forty-eight light emitting diodes (LEDs) 30 mounted on its upper surface and arranged in six rows of eight.

The LEDs 30 are all GaN LEDs which emit electromagnetic radiation over a range of wavelengths including the range 407 to 420nm, and with a peak wavelength of approximately 430nm. The presently preferred LED is that referred to as BLUELINE Hyper 5mm (T1 <sup>3</sup>/<sub>4</sub>) LED, Non Diffused LB 5416 (sold by Infineon Technologies AG, St.-Martin-Str. 53, 81669 Munich, Germany), which has a peak wavelength of 428nm.

Turning now to Figure 4, the upper interior surface of the device 10 is formed with two downwardly extending skirts 34 (only one being visible in Figure 4), each having four semi-circular recesses. With the removable panel 24 temporarily removed, a battery 36 may be received within each pair of corresponding recesses in the two skirts 34.

Turning now to Figure 5, the device further includes connectors 38 which are strips of metal mounted within the casing. The connectors 38 connect the ends of each battery 36 so that the batteries 36 are connected in series. Connectors 40 then connect each end of the series of batteries 36 to the PCB 32.

Turning now to Figure 6, the device further includes a resistor 42, mounted on the PCB 32. The batteries 36, the connectors 38 and 40, the switch 26, the resistor 42 and the LEDs 30 are connected together as shown in Figure 6. The LEDs 30 being in parallel and the other components being in series with each LED 30.

In use, the on/off switch 26 is pressed by the user to activate the array of LEDs 30. The device 10 is then held by the user in such a way as to expose the area of skin that is affected by acne to the electromagnetic radiation emitted by the LEDs 30.

The device 10 is typically held a few centimetres away from the skin. This exposure is continued for a length of time, typically 10 minutes. Other areas of

skin affected by acne may then be exposed for a similar length of time. The on/off switch is pressed to deactivate the LEDs 30 after use. The above treatment is typically performed daily.

## Claims

What is claimed:

1. An apparatus for the cosmetic treatment of acne vulgaris, the apparatus comprising of a housing and an array of LEDs disposed within the housing for irradiating affected skin areas with light in the blue region with a peak wavelength of 430nm.
2. The apparatus according to claim 1, wherein the LED's are arranged substantially parallel to each other.
3. The process according to claim 1 wherein the irradiating step is conducted once per day for about 10 minutes.
4. The apparatus according to claim 1 wherein the apparatus is hand held.
5. The process according to claim 1 wherein the apparatus is held no more than 10mm from the surface of the skin to be treated.
6. The process according to claim 1 wherein the apparatus can be held directly onto the skin.
7. The apparatus according to claim 1 wherein the LED's are arranged in a cluster of 48 LED's.
8. The apparatus according to claim 1 wherein the apparatus has a low power output where the luminous intensity of a single LED is typically 65mcd at 20mA.
9. The apparatus according to claim 1 wherein the apparatus is safe for home use by the end user.
10. The apparatus according to claim 1 wherein the apparatus can be used without medical supervision.



**Application No:** GB 0211272.0  
**Claims searched:** 1 to 10

**Examiner:** Karl Whitfield  
**Date of search:** 23 October 2003

## Patents Act 1977: Search Report under Section 17

### Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance	
<b>X</b>	1-10	<b>GB 2356570 A</b>	<b>(WARBURTON)</b> see abstract & claim 17
<b>X, Y</b>	x: 1-3 & 5-8 <b>Y: 4</b>	<b>WO 00/44441 A1</b>	<b>(BIOLIGHT)</b> see page 5 lines 30-34
<b>X, y</b>	1-3 & 5-8 <b>Y: 4</b>	<b>WO 00/43068 A1</b>	<b>(BIOLIGHT)</b> see page 5 lines 14-18
<b>X, y</b>	x: 1-3, 7 & 8 <b>Y: 4-6, 9 &amp; 10</b>	<b>WO 00/02491 A1</b>	<b>(HARTH et al.)</b> see especially fig 4
<b>X</b>	1-10	<b>WO 95/26217 A1</b>	<b>(MAEF)</b> see especially page 5 & fig 2
<b>A</b>	1-3, 6 & 8-10	<b>US 2003/0009158 A1</b>	<b>(PERRICONE)</b> see abstract
<b>A</b>	1-3, 7 & 8	<b>US 2002/0173833 A1</b>	<b>(KORMAN et al.)</b> see especially fig 4
<b>A</b>	1-3, 7 & 8	<b>US 2002/0128695 A1</b>	<b>(HARTH et al.)</b> see especially fig 4
<b>X, Y</b>	X: 1-3, 7 & 8 <b>Y: 4-6, 9 &amp; 10</b>	<b>US 2001/0023363 A1</b>	<b>(HARTH et al.)</b> see especially fig 4
<b>X, Y</b>	X: 1-3 & 5-10 <b>Y: 4</b>	<b>US 6524329</b>	<b>(BENEDICT)</b> see fig 3 & col 2
<b>Y</b>	4-6, 9 & 10	<b>US 6019482</b>	<b>(EVERETT)</b> whole document

### Categories:

<b>X</b> Document indicating lack of novelty or inventive step	<b>A</b> Document indicating technological background and/or state of the art.
<b>Y</b> Document indicating lack of inventive step if combined with one or more other documents of same category.	<b>P</b> Document published on or after the declared priority date but before the filing date of this invention.
<b>&amp;</b> Member of the same patent family	<b>E</b> Patent document published on or after, but with priority date earlier than, the filing date of this application.